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Response to: ‘Synthetic control methodology as a tool for evaluating population-level health interventions’.

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We read with interest the recent paper from Boutell and colleagues on the use of synthetic control methodology (SCM) as a tool for the evaluation of population-level health interventions (1).

We welcome and support their conclusion that these methods provide a valuable addition to the methodological arsenal of those undertaking evaluations of public health, and other, interventions where randomisation is not possible or practical, or retrospectively where the opportunity for randomisation was missed. We echo their call for other researchers to adopt these methods more widely.

As the literature review reported in Boutell *et al.* was conducted up to February 2016, it has missed more recent developments in the field. In particular we would like to highlight a study which we recently published in this journal in which we describe a Bayesian structural time series approach to SCM and apply it to estimate the impact of local alcohol licensing policies on hospital admissions and crime (2). This approach, originally developed by Brodersen *et al.* (3), extends the work of Abadie and colleagues (4,5) and addresses several of the limitations identified by Boutell *et al.* In particular, by using Bayesian averaging over all combinations of controls or other predictors, this approach minimises the dependence of the counterfactual scenario on the specific set of controls (or other

predictors) selected by the researchers. In addition, through the use of structural time series to generate the synthetic control which represents the counterfactual, temporal changes in the correlations between predictors and outcomes pre-intervention (expressed as changes in model betas) can be taken into account. This methodology does not, therefore, rely on a synthetic control constructed at a single point in time. It is also possible to interpret the results of this approach in the framework of traditional statistical inference through posterior tail area probabilities (posterior predictive p-values), which can be interpreted as the posterior mean of classical p-values (6).

We would like to thank Boutell and colleagues for their clear explanation of synthetic control methods. We hope this will promote their use to improve the extent to which we can learn from, often messy, real-world interventions. By highlighting further developments in the methodology which address some of the limitations of 'traditional' SCM we hope to further broaden their use.

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